## Protein Crystal-Growth Apparatus for Microgravity Facility Hardware

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A microgravity facility hardware for protein crystal growth has been designed by MSFC scientists and engineers based on a common ground-based method of growing protein crystals. The facility is unique in that it contains a disposable interface (or tray) with seven crystallization chambers (fig. 11) designed for improved logistics and handling. The hardware has unprecedented experimental capacity. Nine trays are housed in a cylinder with interlayered actuator assemblies, and six of the cylinders are contained within a one Single-Locker Thermal Enclosure System (fig. 12), offering a total of 378 individual experiments. Two or more of the enclosure units may be manifested per mission.

The facility hardware has flown successfully on STS–62, STS–67, and STS–73, and has produced important improvements in crystal perfection. Once in orbit, the hardware is activated by a simple clockwise rotation of the cam assembly. Notable successes include the production of crystals that allowed for the complete atomic structure and refinement of human antithrombin III by co-investigator Dr. Mark Wardell of Cambridge University. This protein, an important target for the development of improved therapeutics as anticoagulants for the prevention of blood clots, was manifested on all three flights. The U.S. Microgravity Laboratory 2 (STS–73), which launched in October, was notable in that it carried approximately 1,000 individual protein crystal-growth experiments containing 12 different proteins from a total of eight academic, government, and industrial co-investigators.


FIGURE 11.—Microgravity facility hardware for protein crystal growth, with disposable interface and seven crystallization chambers.

FIGURE 12.—Single-Locker Thermal Enclosure System with six cylinders.

Projects have included important research involving the human immunodeficiency virus (HIV–1), the human cytomegalo virus, heart disease, and drug efficacy and delivery. The total number of individual experiments flown in the crystal-growth apparatus during 1995 exceeded the total number of experiments flown during the previous decade. The protein crystal-growth apparatus for microgravity is operated as a government facility and access is

openly available to the general scientific community.

Lim, K.; Ho, J.X.; Wright, B.S.; Twigg, P.D.; Miller, T.; Chapman, J.; Keeling, K.; and Carter, D.C. Analysis and Crystallographic Refinement of Hen Egg-White Lysozyme at 1.4 Angstrom From Crystals Produced in Microgravity. Submitted for publication.

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